

ABSTRACT

A multi-stage apparatus and a process for recycling used engine coolant employs a combination of filtration, dissolved air floatation, centrifugation (hydrocyclone separation), semi-permeable nano filtration, reverse osmosis, and continuous deionization for separating ethylene glycol, with or without propylene glycol, and water from used engine coolant. The engine coolant is pre-filtered through a series of filters. The filters remove particulate contaminants. This filtered fluid is then subjected to dissolved air floatation and/or centrifugation to remove organic petroleum contaminants. Then, it is pressurized prior to being passed through semi-permeable nano filtration. The nano filtration separates the feed stream into a ultra filtration solution and a concentrated waste solution. The concentrate solution is returned to a centrifuged coolant tank for continuous circulation through the nano filtration device. The ultra filtration solution is pressurized and passed through a reverse osmosis device, which separates the feed stream into a permeate solution and a concentrated waste solution. The concentrated waste solution is returned to a ultrafiltrate solution tank for continuous circulation through the reverse osmosis device. The permeate solution is subjected to final refining by continuous deionization which reduces ionic contaminants. Depending upon environmental conditions, a heater and/or heat exchanger maintain the temperature of the process solution within an optimum pre-established operating temperature range.